Philosophical Transactions

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A Serie's of Quere's *propounded by Mr.* Iſaac Newton, *to be determin'd by Experiments, poſitively and directly concluding his new Theory of Light and Colours; and here recommended to the Induſtry of the Lovers of Experimental Philoſophy, as they were generouſly imparted to the Publiſher in a Letter of the ſaid Mr.* Newtons *of* July 8. 1672.

IN the mean while give me leave, Sir, to inſinuate, that I cannot think it effectual for determining truth, to examin the ſeveral waies by which Phænomena may be explained, unleſs where there can be a perfect enumeration of all thoſe waies. You know, the proper Method for *inquiring* after the properties of things is, to deduce them from Experiments. And I told you, that the Theory, which I propounded, was evinced to me, not by inferring 'tis thus becauſe not otherwiſe, that is, not by deducing it only from a confutation of contrary ſuppoſitions, but by deriving it from Experiments concluding poſitively and directly. The way therefore to examin it is, by conſidering, whether the Experiments which I propound do prove thoſe parts of the Theory, to which they are applyed; or by proſecuting other Experiments which the Theory may ſuggeſt for its examination. And this I would have done in a due Method; the Laws of *Refraction* being throughly inquired into and determined before the nature of *Colours* be taken into conſideration. It may not be amiſs to proceed according to the *Series* of theſe *Quæries*; which I could wiſh were determined by the Event of proper Experiments; declared by thoſe that may have the curioſity to examin them.

1. Whether rays, that are *alike* incident on the ſame *Medium*, have *unequal* refractions; and how great are the inequalities of their refractions at any incidence?

2. What is the Law according to which each ray is more or leſs refracted; whether it be that the ſame ray is ever refracted according to the ſame *ratio* of the ſines of incidence and refraction; and divers rays, according to divers *ratio's*; or that the refraction of each ray is greater, or leſs without any certain rule? *That is*, whether each ray have a certain degree of refrangibility according to which its refraction is performed; or is refracted without that regularity?

3. Where-

3. Whether rays, which are endued with particular degrees of refrangibility, when they are by any means ſeparated, have particular colours conſtantly belonging to them; *viz.* the leaſt refrangible, *Scarlet*; the moſt refrangible, *deep Violet*; the middle, *Sea-green*; and others, other colours? And on the contrary?

4. Whether the colour of any ſort of rays apart may be changed by refraction?

5. Whether colours by coaleſcing do really change one another to produce a new colour, or produce it by mixing only?

6. Whether a due mixture of rays, indued with all variety of colours, produces Light perfectly like that of the Sun, and which hath all the ſame properties, and exhibits the ſame *Phænomena*?

7. Whether the component colours of each mixture be really changed; or be only ſeparated, when from that mixture various colours are produced again by Refraction?

8. Whether there be any other colours produced by refraction than ſuch, as ought to reſult from the colours belonging to the diverſly refrangible rays by their being ſeparated or mixed by that refraction?

To determine by Experiments theſe and ſuch like *Quære's* which involve the propounded Theory, ſeems the moſt proper and direct way to a concluſion. And therefore I could wiſh all objections were ſuſpended, taken from *Hypotheſes* or any other heads than theſe two; Of ſhewing the inſufficiency of Experiments to determine theſe *Quære's* or prove any other parts of my Theory, by aſſigning the flaws and defects in my concluſions drawn from them; Or of producing other Experiments which directly contradict me, if any ſuch may ſeem to occur. For if the Experiments, which I urge, be defective, it cannot be difficult to ſhow the defects; but if valid, then by proving the Theory they muſt render all Objections invalid.

So far this accurate Propoſer; whoſe Method appearing to be moſt genuine and proper to the purpoſe it is propounded for, and deſerving therefore to be conſidered and put to trial by Philoſophers, abroad as well as at home; the Publiſher, to invite and gratify Forraigners, was willing to deliver the above recited Extract of Mr. *Newtons* Letter in the language alſo of the Learned, as followeth;

Excerptum ex *Iſaaci Newtoni* Epiſtola, nuper ad Editorem ſcript, quâ ipſe genuinam ſuggerit Methodum, doctrinam ſuam de *Luc* & *Coloribus*, antehac propoſitam, evincendi, ſubjectâ certorum *Quæſitorum*, debitis Experimentis ſolvendorum, ſerie.

Liceat mihi hac occaſione tibi ſignificare, nequaquam cenſere me, efficacem eam eſſe determinandæ veritatis rationem, quâ diverſi examinantur modi, quibus Phænomena explicari poſſunt, niſi ubi perfecta fuerit omnium iſtorum modorum Enumeratio. Noſti, genuinam proprietates rerum inveſtigandi Methodum eſſe, quâ illæ ab Experimentis deducuntur. Ac jam antè tibi dixeram; Theoriam à me propoſitam evictam mihi fuiſſe, non quidem inferendo rem ita ſe habere quia haud ſe habeat aliter, *i. e. non eam deducendo duntaxat à contrariarum ſuppoſitionum confutatione*; ſed ipſam ab Experimentis, poſitivè & directè concludentibus, derivando. *Vera itaque ratio eam examinandi hæc erit, ſi conſideremus ſcilicet, num Experimenta à me propoſita illas Theoriæ partes, quibus accommodantur, reverà probent; vel ſi alia proſequamur Experimenta, quæ ab ipſa Theoria ad examinandam eam ſuggerantur. Atque hoc ipſum Methodo genuinâ fieri velim; perveſtigatis primum ac determinatis Legibus* Refractionis, *priuſquam* Colorum *natura diſquiratur. Præter rem itaque haud fore crediderim, diſquiſitionem hanc ex ſequentium* Quæſitorum *ſerie inſtituere; quæ quidem ut à ſolertibus ſagacibuſque naturæ Myſtis pronunciatis Experimentorum Eventibus, dirimantur, in votis quàm maximè habeo. Ea ſunt;*

Primò, *Num radii, qui* æquali *incidentiâ in idem medium incidunt, Refractiones habeant* inæquales; *quantaque ſint refractionum, quas illi ſubeunt, inæqualitates in quavis incidentia?*

Secundò, *Quænam ea Lex ſit, juxta quam radius quilibet magis minúſve refringitur? ſitnè, quòd idem radius ſemper refringatur ſecundùm eandem rationem Sinuum Incidentiæ & Refractionis; diverſi autem radii, ſecundùm rationes diverſas? An verò, quòd cujuſlibet radii refractio major minórve ſit abſque ulla regula certa? Hoc eſt, Utrum unuſquiſque radius certum habeat gradum Refrangibilitatis, juxta quem fiat ipſius refractio; an verò refringatur ſine iſta regularitate?*

Tertiò, *Num radii, certis gradibus refrangibilitatis præditi, quando, quodemum cumque modo, ſecernuntur, certos obtineant colores ipſis proprios; puta radii minimè omnium refrangibiles, Coccineum; maximè refrangibiles, ſaturum Violaceum; intermedii, ſub-Viridem; alii, alios? Et è contrà.*

Quartò, *Num color cujuſvis generis radiorum ſeorſim exiſtentium mutari poſſint Refractione?*

Quintò, *Utrum colores coaleſcendo reverà ſe invicem mutent ad producendum colorem novum; an verò eum producant nonniſi ſe invicem commiſcendo?*

Sextò, *Num debita radiorum miſcela, omnigenâ colorum varietate prædita, Lucem producat Solari luci ſimillimam; quæque eaſdem omninò proprietates obtineat, eademque Phænomena exhibeat?*

Septimò

Septimò, *Utrum componentes cujuſvis miſcela colores reverà mutentur; an verò ſecernantur duntaxat, quando ex mixtura illa varii colores rurſum producuntur per Refractionem?*

Octavò, *Denturne ulli alii colores Refractione producti præter eos, quos oriri oportet à Coloribus, ad radios diverſimodè refrangibiles pertinentibus, dum illi refractione iſtâ ſecernuntur vel miſcentur?*

Per Experimenta determinare hæc ſimiliave Quæſita, quæ propoſitam Theoriam involvunt, maximè genuina directaque videtur ad Concluſionem via: Proindéque omnes velim Objectiones ſuſpendi, quæ ab Hypotheſibus deſumuntur ulliſve Fontibus aliis, quàm his duobus; quibus nempe vel *oſtendatur Experimentorum ad determinanda hæc* ζητήματα *probandaſve ullas alias Theoriæ meæ partes inſufficientia, hallucinationes defectuſque in Concluſionibus meis inde deductis indigitando;* vel *alia producantur Experimenta, é diametro mihi oppoſita, ſi quæ talia occurrere videantur. Si enim Experimenta, quæ à me urgentur, laborant defectibus, difficile haud fuerit eos oſtendere; ſi veró valida fuerint, eo ipſo dum Theoriam meam aſſerunt probantque omnes Objectiones convellunt.*

Some Annotations of the Learned Dr. Walter Needham *upon a Diſcovery pretended to have been made by the famous Monſieur* Pecquet *of a Communication between the* Ductus Thoracicus *and the* Inferior Vena Cava.

The Relation it ſelf of that pretended Diſcovery, as it is to be found in the Journal des Scavans, *of* Feb. 8. 1672.

THE Diſcovery made about twenty years ſince by M. *Pecquet* of the *Ductus Thoracicus*, ſeemed not ſufficient to clear up all the Difficuities to be met with in the New opinion, which this Channel hath occaſion'd, concerning Sanguification.

It might be ſaid among other things, That there appears no reaſon, why Nature, which does nothing without deſign, ſhould carry the matter of the Blood into the *Sub-clavials*, and thence make it deſcend by the Trunck of the *Vena Cava*, (*A*,) unleſs it be to keep the Chyle from entring all at once and altogether pure into the Heart, and that the mixture, which is made of the Chyle with the Blood along this way, may diſpoſe the Chyle, by a kind of contagious fermentation the

The Annotations of Dr. *Needham.*

(A.) I *think the reaſon there mentioned to be very ſufficient for the inſerting of the Trunck of the* Ductus Thoracicus *into one place alone; at leaſt as good as any that are afterwards given to prove the contrary. For, all proofs of this nature are but looſe conjectures at the beſt: the matter admitting of no other demonſtration than what is ocular.*

(B.) *Till the* Lower *inſertion be* ſhewed, *we are bound to believe, that Nature thought the ſingle*

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